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total eclipse of unusual duration, which, at maximum, may amount to six minutes and fifty seconds.

The eclipse track is rather unfortunately situated. Beginning in the Pacific Ocean, just off the coast of Peru, it sweeps across South America, traversing the Bolivian Mountains, the forests of Brazil, and the higher lands of the eastern coast. Then it crosses the Atlantic, almost along the equator, just grazes the southern coast of the great western projection of Africa, passes temporarily out to sea again, and crosses the main part of the dark continent by way of the Congo basin and Lake Tanganyika—finally leaving the earth's surface at a point in the Indian Ocean not far from the African coast.

The region within which a partial eclipse is visible extends far northward and southward, including practically all of South America except the extreme southern tip, and all of Africa except the Mediterranean coast. The region where totality is longest lies in the Atlantic, and the maximum duration of eclipse observable from land stations is about four minutes, which is reached on the east coast of South America and the west coast of Africa. There is, to be sure, one small island in the Atlantic, lying almost in the central line of totality, where the eclipse lasts fully six minutes; but as this spot, known as St. Paul's Rocks, consists of a few jagged rocks rising to a height of 60 feet from deep water, with no anchorage and no fresh water, it is hardly an inviting station for even the hardest astronomer, in spite of the fact that certain optimistic souls have nominated it as a way station for transatlantic airplane flights.

The climatic conditions along most of the track are unfavorable—the best chances of fine weather being on the high lands back of the eastern coast of Brazil, and in central Africa above Tanganyika. On account of the remoteness of these stations, and of the disorganization resulting from the war, few expeditions appear to be projected to view the eclipse. One English and one or two American parties, however, are likely to make the journey.

MAPPING FROM THE AIR

REQUESTS made to the United States Geological Survey, Department of the Interior, for information concerning the possibilities of photographic surveying from airplanes or other aircraft have recently become so numerous that it is deemed necessary to issue a statement on this subject. For two years the United States Geological Survey, which prepares and

publishes more maps than any other organization in the world, has devoted much time and labor to the study of problems to be solved in photo-aerial surveying. The camera has long been used in surveys on the ground, and the Geological Survey has been making studies to determine the best methods of using it in aerial work. Before the war the panoramic camera was employed by the Geological Survey for mapping in Alaska, and it had been widely used for photographic surveying in Canada and in Europe. Aerial photographic surveying involves no new principles, yet it differs essentially from photographic surveying on the ground, for the line of view from a camera in a balloon or an airplane is vertical, not horizontal. A complete statement of the Geological Survey's investigations in photographic mapping from the air will later be prepared for publication.

The problem of photographic surveying from the air is dominantly an engineering problem. Photographic technique is of course an essential part of the work, but it is a subordinate part, for the best photographs are valueless as map-making material unless they are accompanied by the requisite engineering data. Projections, adjustments, and other details of map-making technique are as necessary in photo-aerial surveying as in other surveying, and all map-making work should therefore be the work of experienced engineers.

Photographic mapping from aircraft is entirely practicable but it has not yet been brought to the point where it can supersede ground surveying. The science of cartography will no doubt be greatly advanced when the aerial method is perfected, but fundamental problems remain to be solved, and this fact should be recognized and all possible energy should be devoted to the solution of those problems. It is hoped that solutions of the essential problems in photo-aerial surveying will soon be obtained, and that this method will be put to practical use in map-making.

FIFTH NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES

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